**Investigation**

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For the investigation I think we could get students to investigate the relationship between chain length of alcohols and the heat of combustion.

Students to be provided with spirit burners and samples of alcohols of different chain lengths (e.g. methanol, ethanol, propan-1-ol and butan-1-ol). -- not sure how many they would get through in one lesson though if they needed to do repeated trials. Maybe they should just do one of each -- would make calculations easier although data a bit less reliable

For the data they would need to collect:

* Temperature increase of water
* Mass lost from spirit burner

This would allow them to calculate:

* heat gain by water (Q = m c delta T)
* heat released per gram of alcohol (heat gained by water / mass of alcohol)
* heat released per mole of alcohol (heat gained by water / moles of alcohol)

I was thinking of the following for their assessment:

* **PLANNING:**A plan done as a group which includes steps they will follow and a risk assessment. Can be completed outside of class.  
    
  ***Marked on:***
  + Validity of plan (whether method is appropriate and fits the aim given)
  + Risk assessment (consideration of major risks and suggestions for minimising risks)
* **CONDUCTING:** Completing the investigation in class.
* **ANALYSIS:** 1 hour in-class test. Not 100% sure what it would involve but here are my current ideas... Final test would depend on time...
  + Calculating the heat gained by water
  + Calculating the heat per gram of alcohol
  + Graphing the relationship between carbon-length (x-axis) and heat per mole alcohol (y-axis)
  + Calculating the heat per mole of alcohol
  + Writing thermochemical equations for the combustion of alcohols including delta H
  + Drawing scale enthalpy diagrams showing delta H
  + Comparing their trends to literature values and commenting on differences (I'd imagine their values will be lower than literature for each trial because of heat lost to the environment)
  + Suggesting improvements for experiment
  + Explaining why heat is released in a combustion reaction (in terms of bonds breaking and bonds forming)
  + Explaining the trends in heat of combustion as chain length increases

I was thinking of making the analysis test open-book. It would probably help the non-physics students a lot being able to refer to Worked Example 4.7 (page 222). I say this in particular because physics students have done heating and cooling and Q=mc delta T problems already. And I don't think it would make the test too easy because they still have to be applying everything to this situation.

What do you think?